REMARKS

Claims 3 and 16 have been amended to correct minor typos, while claim 5 has had its status changed to "Withdrawn" for reasons presented herein. Applicants respectfully submit that the rejections set forth in the Office Action are all overcome for the reasons presented below and that the application is now in condition for allowance.

With reference to the Office Action, the Examiner asserts that claims 31 and 32 read on the elected embodiment of the invention comprising a V- shaped laser, such as is illustrated in FIG. 7B. Applicants respectfully disagree with this assertion since claim 31 recites that the laser cavity includes multiple segments that are joined end to end at an etched facet to form the laser output. This language clearly refers to a ring type laser, not to a V-shaped laser such as the one illustrated in FIG. 7B, for example.

Claims 2, 4, 5, 7-9, 13-24, 27 and 42-47 stand rejected under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement.

With all due respect, the Examiner has misinterpreted restriction practice under MPEP Section 800 to allow the treatment of the specification as if all description of non-elected species is withdrawn from the specification, which is not correct. Claims to non-elected species are withdrawn from consideration in restriction practice, not disclosure in the specification. Further, assuming the generic claims are found to be allowable, any of the withdrawn claims that are dependent on the allowable generic claims then qualify to be rejoined.

As will be shown below, the foregoing rejection under 35 U.S.C. 112, first paragraph, is not merited since all the recited features of the rejected claims are clearly disclosed in the specification. However, the Examiner can correctly object to claims as being directed to a non-

elected species. In this regard, Applicants do admit that claim 5 is directed to a non-elected ring laser and have thus changed claim 5's status to "Withdrawn."

As for the remaining claims in the foregoing rejection, Applicants stress that the disclosure of the various embodiments of the invention clearly indicates in numerous places that the various features of the invention can be combined together in each of the disclosed embodiments. For example, Paragraph [0009] in the published application reads as follows:

> [0009] In a preferred form of the invention, unidirectionality in semiconductor lasers is enhanced by forming at least one air gap in the laser cavity, or waveguide, with each gap being defined by spaced apart facets to enhance the side-mode suppression ratio in that cavity. The gaps are provided, for example, by etching through the cavity of a ridge-type ring or V-shaped laser which is integrally fabricated on the surface of a substrate. The gap or gaps may be etched in any leg of the laser cavity, and may be etched at 90 degrees to the laser axis or, alternatively, at an angle to the axis. In the latter case, the gaps may be etched in spaced-apart pairs, with the waveguide segment between the gaps being offset to compensate for refraction at the etched facets. In another form of the invention, when the laser output is coupled to a photonic device, back-reflection is minimized by the provision of a facet at the Brewster angle at the distal end of the photonic device.

Further, Paragraph [0037] specifically notes the variations that can be made to the elected V-shaped laser species:

> [0037] The air gap structure of the present invention serves to significantly reduce, or prevent, back-reflection when a ring cavity or a V-shaped cavity laser is coupled to another photonic element,

> such as the EAM device described with respect to FIG. 1. Back reflection is further reduced by the use of a Brewster angle in the photonic element, as at the far end of the EAM in FIG. 1.

Thus, for example, the assertion in the Office Action that the gap arrangements of FIGs. 6A and 6B are limited to the ring laser embodiments is also incorrect. Nowhere is the description of the features of FIGs. 6A and 6B is mention made that they are limited to ring laser embodiments. These features can clearly also be employed with the V-shaped embodiments of FIGs. 7A and 7B.

With specific reference to the rejected claims, the limitation in claims 2 and 8 regarding cavity length is disclosed in Paragraph [0027] of the published application and clearly is not intended to be limited to any one particular embodiment of the invention.

Paragraph [0037] presented above makes it clear that the V-shaped laser can be employed with a photonic device (EAM) of FIG. 1 as covered in claims 4 and 7. This same paragraph makes mention of the Brewster's angle feature recited in claims 7 and 10.

Finally, claims 27 and 42 recite features of FIG. 6B, which as stated above, clearly are not limited to use in a ring laser as evidenced, for example, by the disclosure in Paragraph [0009].

In view of the foregoing, Applicants respectfully submit that the rejection of claims 2, 4, 5, 7-9, 13-24, 27 and 42-47 under 35 U.S.C. 112, first paragraph, is not merited and should be removed. Furthermore, of these claims, all but claim 5 properly recite features of the elected species.

Regarding the objection to claim 3, Applicants agree with the Examiner and have amended the claim to correct the noted mistake.

Claims 1, 3, 6, 25, 26, 31 and 32 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims recite a monolithic segment with an etched gap extending though the segment. The Examiner asserts that this is an oxymoron because an element that is divided by a gap cannot be monolithic. The Examiner also contends that "monolithic semiconductor" is contradictory to Applicant's own description of the laser in U.S. Patent 6,680,961, in which the semiconductor laser is described as being composed of several layers and is not cut out from a single crystal.

Applicant respectfully disagrees with this rejection. The Examiner is applying one known definition of "monolithic" which is "formed from a single crystal." However, the phrase "monolithic semiconductor" is widespread in the semiconductor industry to mean any device or circuit formed on a unitary, common substrate. The Merriam Webster Online dictionary includes a number of definitions of monolithic including the following: b (1)**:** formed from a single crystal <a *monolithic* silicon chip> **(2)**: **produced in or on a monolithic chip <a *monolithic* circuit>**2 **a:** cast as a single piece <a *monolithic* concrete wall> **b:** formed or composed of material without joints or seams <a *monolithic* floor covering> **c:** consisting of or constituting a single unit

Definition 1b (2), which is bolded above, is clearly the definition intended in the subject claims. A monolithic laser cavity is thus one that is formed as a single unitary structure on a single common substrate. This by no means excludes the possibility that multiple devices are formed in the layers grown on the substrate, such as by epitaxial deposition. As further support of this assertion, a search of the USPTO database on March 8, 2008 uncovered 61 patents with the phrase "monolithic semiconductor" in the title. A review of any of these patents shows they

disclose layered structures formed on a common substrate. "Monolithic semiconductor" is thus not limited to a single crystal structure as the examiner suggests, but can also be employed to describe any semiconductor structure in which multiple structures or devices are formed on a single common semiconductor crystal substrate. Indeed, an element that is divided by a gap remains monolithic if the gap is formed through etching of facets, which do not pass all the way through the crystal as in cleaving, thus leaving the substrate in one piece.

For the foregoing reasons, Applicants respectfully submit that the rejection of the noted claims under 35 U.S.C. 112, second paragraph, is traversed.

Turning now to the prior art rejections, claims 1, 3 and 25 stand rejected under 35 U.S.C. 102(e) as being anticipated by Sirbu et al. (6,546,029), hereinafter '029. In support of this rejection, the Examiner notes that "etched" is a product by process limitation that does not have a patentable weight in a device claim and that the same reasoning applies to the other claims.

Applicants respectfully traverses this rejection because '029 fails to disclose or suggest two key features of the rejected claims which have already been discussed- a monolithic semiconductor cavity and etched gaps or facets formed in or on the cavity.

The '029 patent discloses a device with an air-gap that is formed through bonding or wafer fusion of two structures (for example, see col. 3, lines 28-37; Fig. 2; col. 5, lines 8-47) and as such cannot meet the "monolithic" limitation in the first element of claims 1 or 25: "a monolithic semiconductor laser cavity having at least one segment and at least one output;" Further, in order to be monolithic as discussed previously, the gaps and facets must be etched. In the subject claimed structure, which is preferably formed through epitaxially growth and the

facets are formed through etching, the resulting structure is monolithic because it remains as one piece after fabrication.

Regarding the term "etched" not being given patentable weight in the claims, Applicants strongly disagree and respectfully direct the Examiner's attention to MPEP Section 2113, which recites the analysis of product by process claims. As is well established, a product by process claim is anticipated under 35 U.S.C. 102 by a reference disclosing the product made by another process if the resulting products are the same.

Applicants take issue with the application of this rule to the subject claims first because the claims are not product-by–process claims and second, because an etched gap or facet in the claimed invention is in fact substantially different from gaps and facets made by other processes, such as cleaving or bonding.

A true product-by-process claim employs terminology such as "a product made by the process comprising the steps of ….," for example. Proper application of the product-by-process claim rule would be if a claim recited "an etched laser facet formed by the process of, etc." In that example, disclosure of an etched facet made by any technique would anticipate the claim under MPEP 2113 if it could be shown that the resulting etched facets are both the same. This is not the case here, however.

Applicants further submit that application of the foregoing rule to the subject apparatus claims only because the adjective "etched" is used to define one of the claimed elements of the recited structure is improper. As is well known in the semiconductor laser art, laser facets can be formed, for example, by cleaving or by etching. The resulting facets are almost always described as either being cleaved facets or etched facets, which terms clearly suggest structural differences

between the two types of facets. The use of "process step implying" adjectives to define structural elements in claims is ubiquitous and is clearly one means by which structural elements are limited. For example, a "surface" is much broader than an "etched surface." Applicants submit that in recognition of this legitimate form of defining structural elements, MPEP Section 2113 was revised in February 2003 (Revision 1 of the 8th Edition) to recite the following passage that is directly on point in the present case:

> >The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and **"ETCHED"** are capable of construction as structural limitations.)< (emphasis added)

In re Garnero confirms that adjectives which imply how a recited structural element is assembled, formed, etc. can nevertheless be construed as structural imitations. Not only that, but the case actually lists the very term at issue in the present case, "etched," as being the type of term that can and Applicants submit should be construed as a structural limitation. The fact that the revisers of the MPEP determined that it was appropriate to add the above passage to Section 2113 is strong evidence that the product by process rule should not be applied any time a structure claim defines one of the structural elements using an adjective, such as etched, that defines the manner by which one element of the recited structure is formed.

The use of etched gaps and facets in the claimed invention is also necessary to form the recited device as a monolithic structure as has already been noted. Cleaved facets spit the whole

crystal into multiple pieces, which are no longer monolithic. Gaps as in '029, which are formed by stacking discrete layers and bonding them together, also cannot be considered to be monolithic as recited in the subject claims. In contrast, the formation of different materials on a single crystal substrate, such as by epitaxial deposition, inherently results in a monolithic unitary structure.

In view of the foregoing, Applicants respectfully submit that the rejection of claims 1, 3 and 25 is traversed.

Claims 1, 6, 25, 26, 31 and 32 also stand rejected under 35 U.S.C. 103(a) as being unpatentable over Behfar-Rad (5,132,983) hereinafter '983, and further in view of Evans et al. (4,952,019) hereinafter '019.

Applicants respectfully traverse this rejection because the combination of teachings of the references fails to establish a prima facie case of obviousness under 35 U.S.C. 103, i.e. the combination of references does not teach or suggest each of the elements in the rejected claim.

First, there is no disclosure of "at least one etched gap extending through said at least one segment" in the '019 or '983 references. Once again, the term "etched" clearly is a structural limitation that should be given patentable weight for the reasons discussed previously.

Additionally, with respect to claim 1, the '983 patent does not disclose "an etched gap extending through said semiconductor waveguide cavity" as the Examiner asserts. On the contrary, the gap disclosed in the '983 patent is between two distinct ring lasers and is not through a semiconductor waveguide cavity as recited in the claim. In particular, FIG. 5 of the '983 patent illustrates an arrangement where a first ring laser 10 is injection-locked by the output light from a second, prior ring laser 70.

The Examiner also asserts that FIG. 16 of '983 shows "an etched gap extending through said semiconductor waveguide cavity." On the contrary, the gap illustrated in FIG. 16 is again between two distinct ring lasers and not through a semiconductor waveguide cavity of one of the lasers, for example. In particular, the facet 190 is at one end of a first laser and is adjacent the facet 192 of a second laser. The combination of elements shown in FIG. 16 forms a ring oscillator.

As for claim 31, which is directed to a ring laser as mentioned previously, once again the 983 patent does not disclose a gap formed in a multiple segment monolithic laser cavity. The '983 reference only discloses multiple lasers interfaced to one another to form a ring oscillator.

Thus, for the foregoing reasons, Applicants respectfully submit that the combination of teachings of the '019 and '983 patents does not establish a prima facie case of obviousness under 35 U.S.C. 103 as to any of the rejected claims and that this rejection is also traversed.

In view of the foregoing, Applicants respectfully submit that all of the rejections are traversed and that the pending claims are patentable and allowable. Accordingly, favorable reconsideration of the application is respectfully requested.

Respectfully Submitted,

By /wab/
William A. Blake
Reg. No. 30,548

JONES, TULLAR & COOPER, P.C.
Customer No. 23294
P.O. Box 2266, Eads Station
Arlington, VA 22202
Phone (703) 415-1500 Fax (703) 415-1508
E-mail: mail@jonestullarcooper.com
Dated: March 10, 2008
Docket No. BIN 9/US